**Homework 5: Due at start of class on Dec 9.**

## Problems From Text

9.6 (a) and (b), 10.2, 10.8*, 10.10 (Solutions will not be provided for questions marked with stars, as they are part of the final project)

## Familiarity with MATLAB Transmitter

This problem will begin to familiarize you with the transmitter which you will use throughout the remainder of the course to test your receivers.

a. Read Chapter 9.5 and Appendix H of the textbook.

b. As stated in Appendix H, the large number of samples necessary to implement a transmitter at RF is so large, that it is rarely practical to do so. A simplified description of the provided transmitter is shown in Fig. 1. The pulse shape is oversampled by a factor $M = 50$, such that the pulse shaped message $s_p[l]$ is a sampled version of the pulse shaped signal $s(t)$ with sampling frequency $f_s = 50$ MHz. Assume the absolute bandwidth of the pulse shaped message $s_p[l]$ is 1 MHz, and $f_{IF} = 220$ MHz. We assume there are no adjacent users, narrowband interferers, and broadband noise. Draw the spectrum of the received signal (you may assume the $S_p(f)$ has a rectangular shaped spectrum).

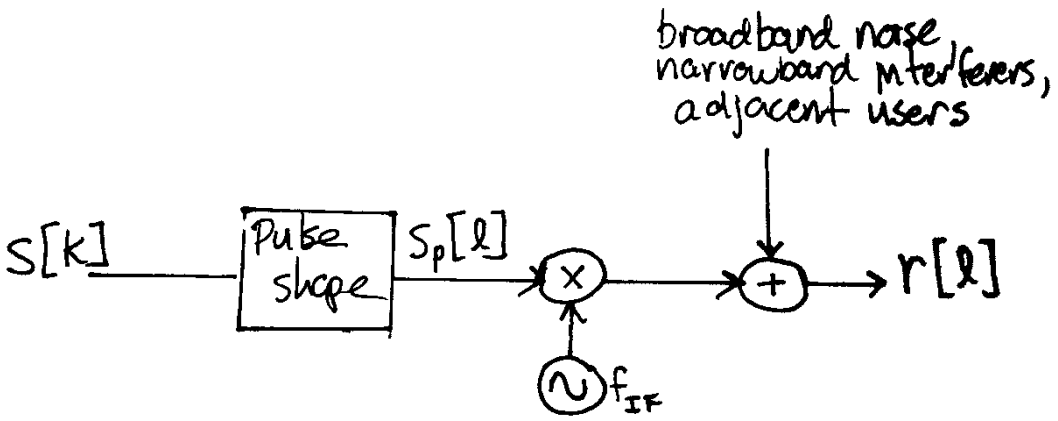


Figure 1: Simplified Transmitter Block Diagram

c. Look inside the script `datagen.m` available on the course website. Then, run it and plot the spectrum of the received signal `r`. Does the spectrum match what you drew previously? Explain. (Note we are only interested in the location of the nonzero spectrum and its bandwidth, the particular shape of the spectrum will depend on the message.)

## Additional Reading

Read and familiarize yourself with the final project description and modified Chapter 15 that are available on the course website.